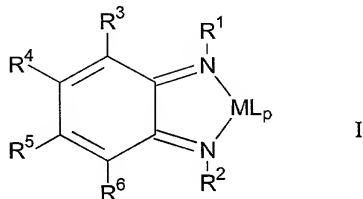


WHAT IS CLAIMED IS:

1. A catalyst comprising a complex having formula I:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R<sup>1</sup> and R<sup>2</sup> are the same or different and are independently selected from hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, or C<sub>7-15</sub> aralkyl, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, and with the proviso that not more than 1 of R<sup>1</sup> or R<sup>2</sup> is a hydrocarbon which is branched at the imino-bonded carbon atom;

R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, and R<sup>6</sup> are independently hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, C<sub>7-15</sub> aralkyl, C<sub>1-10</sub> alkoxy, or C<sub>1-10</sub> dialkylamino, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, or wherein any two adjacent R<sup>3</sup> through R<sup>6</sup> form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.

1                    2.     The catalyst of claim 1 wherein M is a metal from Groups 8  
2     to 10 of the Periodic Table.

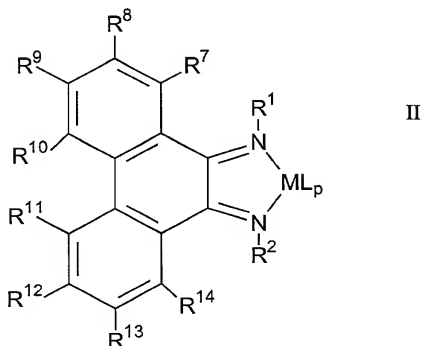
1                    3.     The catalyst of claim 1 wherein M is selected from the group  
2     consisting of nickel, palladium, iron, and cobalt.

1                    4.     The catalyst of claim 1 wherein L is a charged ligand selected  
2     from the group consisting of unsubstituted and substituted cyclopentadienyl,  
3     indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy,  
4     alkoxy, pyrrolyl, indolyl, carbazoyl, quinoliny, pyridinyl, azaboroliny, boraaryl,  
5     and mixtures thereof.

1                    5.     The catalyst of claim 1 wherein L is a neutral ligand selected  
2     from the group consisting of carbonyl,  $\eta^6$ -aryl,  $\eta^4$ -butadiene,  $\eta^4$ -cyclobutadiene,  
3      $\eta^4$ -cyclooctatetraene, tertiary phosphine, and mixtures thereof.

1                    6.     The catalyst of claim 1 wherein  $R^1$  and  $R^2$  are both hydrogen.

1                    7.     The catalyst of claim 1 having formula II:



3                    where

4                    M is a metal selected from Groups 3 to 10 of the Periodic  
5                    Table;

R<sup>1</sup> and R<sup>2</sup> are the same or different and are independently selected from hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, or C<sub>7-15</sub> aralkyl, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, and with the proviso that not more than 1 of R<sup>1</sup> or R<sup>2</sup> is a hydrocarbon which is branched at the imino-bonded carbon atom;

R<sup>7</sup>, R<sup>8</sup>, R<sup>9</sup>, R<sup>10</sup>, R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> are independently hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, C<sub>7-15</sub> aralkyl, C<sub>1-10</sub> alkoxy, or C<sub>1-10</sub> dialkylamino, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, or wherein any two of R<sup>7</sup> through R<sup>14</sup>, or R<sup>10</sup> and R<sup>11</sup> form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.

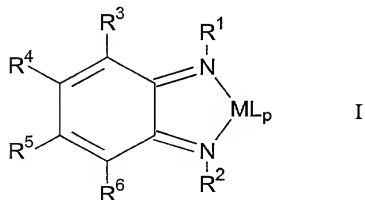
8. The catalyst of claim 1 further comprising an activator.

9. The catalyst of claim 8 wherein the activator is selected from the group consisting of alumoxanes, alkylaluminum compounds, and mixtures thereof.

10. The catalyst of claim 8 wherein the activator is an acid salt containing non-nucleophilic anions.

11. The catalyst of claim 8 wherein the activator is selected from the group consisting of lithium tetrakis(pentafluorophenyl) borate, lithium tetrakis(pentafluorophenyl) aluminate, anilinium tetrakis(pentafluorophenyl) borate, and mixtures thereof.

12. A process for coupling two or more olefins, the process comprising:
- 1) introducing into a reaction vessel an activator and a catalyst of claim 1 having formula I:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R<sup>1</sup> and R<sup>2</sup> are the same or different and are independently selected from hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, or C<sub>7-15</sub> aralkyl, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, and with the proviso that not more than 1 of R<sup>1</sup> or R<sup>2</sup> is a hydrocarbon which is branched at the imino-bonded carbon atom;

R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, and R<sup>6</sup> are independently hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, C<sub>7-15</sub> aralkyl, C<sub>1-10</sub> alkoxy, or C<sub>1-10</sub> dialkylamino, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, or wherein any two adjacent R<sup>3</sup> through R<sup>6</sup> form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied; and

28                   2)     introducing at least one olefin into the reaction vessel,  
29                             wherein at least two molecules of olefin are coupled together.

1                   13.    The process of claim 12 wherein M is a metal from Groups  
2                   8 to 10 of the Periodic Table.

1                   14.    The process of claim 12 wherein M is selected from the group  
2                   consisting of nickel, palladium, iron, and cobalt.

1                   15.    The process of claim 12 wherein L is a charged ligand  
2                   selected from the group consisting of unsubstituted and substituted cyclopentadienyl,  
3                   indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy,  
4                   alkoxy, pyrrolyl, indolyl, carbazoyl, quinolinyl, pyridinyl, azaboroliny, boraaryl,  
5                   and mixtures thereof.

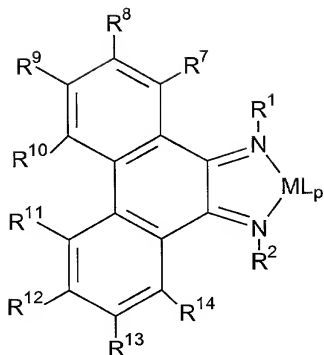
1                   16.    The process of claim 12 wherein L is a neutral ligand selected  
2                   from the group consisting of carbonyl,  $\eta^6$ -aryl,  $\eta^4$ -butadiene,  $\eta^4$ -cyclobutadiene,  
3                    $\eta^4$ -cyclooctatetraene, tertiary phosphine, and mixtures thereof.

1                   17.    The process of claim 12 wherein the activator is selected from  
2                   the group consisting of alumoxanes, alkylaluminum compounds, and mixtures  
3                   thereof.

1                   18.    The process of claim 12 wherein the activator is an acid salt  
2                   containing non-nucleophilic anions.

1                   19.    The process of claim 12 wherein the activator is selected from  
2                   the group consisting of lithium tetrakis(pentafluorophenyl) borate, lithium  
3                   tetrakis(pentafluorophenyl) aluminate, anilinium tetrakis(pentafluorophenyl) borate,  
4                   and mixtures thereof.

1                   20.    The process of claim 12 wherein said catalyst has the formula:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R<sup>1</sup> and R<sup>2</sup> are the same or different and are independently selected from hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, or C<sub>7-15</sub> aralkyl, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, and with the proviso that not more than 1 of R<sup>1</sup> or R<sup>2</sup> is a hydrocarbon which is branched at the imino-bonded carbon atom;

R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, and R<sup>6</sup> are independently hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, C<sub>7-15</sub> aralkyl, C<sub>1-10</sub> alkoxy, or C<sub>1-10</sub> dialkylamino, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, or wherein any two of R<sup>7</sup> through R<sup>14</sup>, or R<sup>10</sup> and R<sup>11</sup> form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.